A Work Project, presented as part of the requirements for the Award of a Master's Degree in International Management from the Nova School of Business and Economics.

DIGITALIZATION OF THE WORKPLACE:

HOW OPENNESS OF EMPLOYEES MODERATES THE EFFECTS OF TECHNOSTRESS ON JOB SATISFACTION.

Melanie Krauss | 33353

Work project carried out under the supervision of:

Samantha Sim

03.01.2020

Abstract

The present work project examines how openness as one of the Big Five Personality Traits moderates the relationship between technostressors and job satisfaction. Technostress is defined as stress experienced by employees through the use of information and communication technologies (ICT). After conducting a survey a regression analysis was performed. The study suggests that openness positively moderates the relationship between techno-overload, -invasion, -complexity and -insecurity and job satisfaction, such that the corresponding technostressor affects job satisfaction weaker if the level of openness is high. No significant moderation could be found for techno-uncertainty. From these results practical recommendations for managers and HR departments are derived.

Keywords*: Technostress, Openness, Job Satisfaction, Information and Communication Technology*

This work used infrastructure and resources funded by Fundação para a Ciência e a Tecnologia (UID/ECO/00124/2013, UID/ECO/00124/2019 and Social Sciences DataLab, Project 22209), POR Lisboa (LISBOA-01-0145-FEDER-007722 and Social Sciences DataLab, Project 22209) and POR Norte (Social Sciences DataLab, Project 22209).

1 Introduction

Information and communication technologies (ICT) are developing in an incomprehensible speed (Boyer-Davis, 2019). By 2019, 293.6 billion e-mails (business and consumer) were sent per day and the number is estimated to increase up to 347 billion emails per day by 2023 (Radicati Group Inc., 2019). A massive amount of data of around 2.5 quintillion bytes (representing a number with 18 zeros) is produced per day, creating high intensity of information (Jacobson, 2013). Meanwhile, changes in ICT also affect work environments and the way employees interact, communicate and collaborate. On the one hand, technology is a key success factor for companies in the future, as it meets companies' need for flexibility and agility (Garca-Alcaraz et al., 2017). On the other hand, it arises the issue of technostress, defined as stress experienced by employees due to their use of ICT, since end-users suffer from e.g. increased workload, information density, the need to constantly adapt to changes or the inability to cope with technology's complexity (Ragu-Nathan et al., 2008; Tarafdar et al., 2010). Consequences can be negative effects on employee's job satisfaction, performance or well-being (Tarafdar et al., 2010). Not only is ICT a prerequisite for companies to stay relevant in the future. Employees also depend on ICT in order to efficiently perform their operational tasks and to collaborate on a daily basis (Dimensional Research, 2015). The dilemma of ICT being a key success factor and simultaneously a source of decreasing job satisfaction and health issues clearly shows the importance of understanding the phenomenon of technostress.

Technology eliminates repetitive tasks, creates complex solutions, and consequently changes job profiles and requirements (Schwarzmüller et al. 2018). Hence, problem-solving ability, curiosity and openness for new developments, creativity and a flexible mindset, attitudes which are summarized by one of the 'Big Five' personality traits 'openness', are characteristics companies highly value (Frenkel et al., 1995; S. Parker et al. , 2001). As companies are seeking for human resources high in openness in the future, it would be important to un-

derstand how these employees react to technostress, whether they are more affected by it or whether openness might protect them from negative effects on job satisfaction. However, research has never examined the relationship of openness, technostress and job satisfaction. Therefore, this master thesis aims to fill this gap. The research question of this study therefore is **how openness moderates the relationship of technostress and job satisfaction.**

In order to answer this research question, a detailed literature review of stress- and technostress literature was undertaken. Based on the insights, a survey with professionals whose work depends on ICT was conducted. Afterwards the hypotheses were tested running a regression analysis with moderator. Finally, practical recommendations for companies were derived. The results of this study enable HR departments and managers to get detailed insights into the effects of technostressors on employees with certain levels of openness and allow them to find solutions and prevention strategies against it.

2 Literature overview and theory

2.1 The concept of stress

Although stress has been an extensively studied phenomenon, conceptual and perspectival issues impeded researchers to finally define the 'concept' of stress. From the conceptual point of view, stress can be treated as a stimulus (Elliot & Eisdorfer, 1982), a psychological dysfunction (Ivancevich & Matteson, 1980) or a response (Hobfoll et al., 1988) to name just a few examples. From a research perspective, stress can be understood as individual appraisal, as an environmental factor, or a mix of both (D. F. Parker & DeCotiis, 1983).

The present study follows the definition of stress of McGrath (1976), who defined stress as a 'imbalance' experienced by a person in an "environmental situation that is perceived as presenting a demand which threatens to exceed the person's capabilities and resources for

meeting it, under conditions where he or she expects a substantial differential in the rewards and costs from meeting the demand versus not meeting it" (McGrath, 1976, p. 1352). It is important to note that in this definition stress is seen as a response of an individual's appraisal of external demands, while the consequences of not meeting these demands play an important role for the individual (D. F. Parker & DeCotiis, 1983).

Consistent with McGrath's imbalance definition, Lazarus & Folkman (1984) defined the transactional model of stress and coping (TMSC). This model describes how an individual evaluates a situation or the posed external demands according to his/her sense of importance. Consequently, a situation can be perceived as positive, irrelevant or stressful. Afterwards, an evaluation of the resources and coping mechanism available to fulfill external requests follows, which in turn can influence the perception of the situation.

In accordance with Lazarus' and Folkman's (1984) idea of external demands and internal resources, the 'job demands-resources model' (JD-R model, Demerouti et al., 2001) assumes that job demands, such as work conditions (e.g. time pressure) lead to exhaustion, whereas lacking resources, such as rewards, security or support, may lead to disengagement. Both exhaustion and disengagement can lead to job burnout. While the JD-R model allows for an objective consideration of demands and resources, the concept of imbalance acknowledges the importance of individual appraisal. Both models are helpful frameworks, which provide the theoretical foundations to explain how technostress, job satisfaction and an individual's personality traits are linked, as explained in the following sections.

2.2 ICT and technostress

Technostress can be defined as stress, experienced by employees due to the use of ICT, which is caused by an employee's attempt to meet the demands arising from new technologies, e.g. evolving cognitive and social abilities in order to adapt to their use (Ragu-Nathan et al., 2008). In this study, ICT are defined as all technologies (hardware, software, tools, etc.)

which support the collaboration, interaction and communication of employees as well as the sharing of information and knowledge in companies (Antonelli et al., 2000). Technostress is a result of various technostressors, also called technostress creators (Tarafdar et al., 2010). Technostressors can be seen as a new category of job-stressors, or in the wording of the JD-R model, job-demands through the use of ICT. Although the technostressors may differ from previously defined job-stressors (e.g. shift work or time pressure, Demerouti et al., 2001), the effects are the same: Explained by the TMSC, technostressors create stress from the perceived imbalance of demands and resources, for example due to constant connectivity or job related insecurity. This in turn can lead to second-level outcomes, e.g. decreasing job satisfaction or health issues (Ragu-Nathan et al., 2008).

While recent researchers, such as Ragu-Nathan et al. (2008), take into account the multifaceted shape of ICT which creates technostress, earlier studies focused on computers in general when defining the term. Brod (1984) for example defined technostress as "a modern disease of adaption caused by an inability to cope with new computer technologies in a healthy manner" (p. 16). Also Arnetz (1997) saw technostress as "a state of arousal observed in certain employees who are heavily dependend on computers in their work" (p. 36). However, nowadays technostress does not only evolve from the unfamiliar use of computers but specifically from ICT. Considering the unimaginable speed ICT evolves, examining the effect of technostress also implies examining new ICT, which contributes to technostress studies. The types of ICT included in the survey and definitions can be found in *appendix 1 and 2*.

The technostress model (Ragu-Nathan et al., 2008) comprises five different technostressors. **Techno-overload** refers to the perception that the employee needs to work more and faster due to new technologies. **Techno-invasion** describes the development of blurring lines between leisure and working time and the feeling of constant connectivity with their work. **Techno-complexity** is associated with the feeling of the employee being unable to

handle the new technology due to lacking skills and knowledge as well as lacking time and understanding. **Techno-insecurity** describes the perception of a constant threat through new ICT, either because the employee fears being replaced by automation or by other employees with a better understanding of the new technology. **Techno-uncertainty** refers to the constant change and development of the implemented ICT, leading to the necessity of continuously adapting to the new technology (Ragu-Nathan et al., 2008).

The phenomenon of technostress is already known for decades. However, as ICT increasingly influences work environments, researcher's interest in technostress is growing. As one important contribution, the effects of technostress on various job-related outcomes were studied. Among these, health-related problems, turnover, decrease in productivity and performance, engagement or job satisfaction were examined (Barber & Santuzzi, 2015; Boyer-Davis, 2019; Ragu-Nathan et al., 2008; Srivastava et al., 2015; Tarafdar et al., 2010). However, among all job-related outcomes which are affected by technostress, job satisfaction has the highest importance, which is why it was chosen as dependent variable (DV) in this study. Firstly, job satisfaction is important, because it is often related to other outcomes, such as health issues, performance (Judge et al., 2001), extra-role behavior (Bowling, 2010), engagement and turnover (Ragu-Nathan et al., 2008). Secondly, lack of job satisfaction has serious effects on organizations as health problems and turnover increase costs. Low job satisfaction also decreases innovation, performance or revenue, hence job satisfaction can be seen as the backbone of a company's success (Diaz & Rhodes, 2018). The strong link of job satisfaction to other job-related outcomes and the high relevance for a company's success clearly justify the choice of job satisfaction in this study.

Furthermore, research examined technostress in the context of organizational and job factors, for example how it affects employees in different functions and industries (e.g. in accounting (Boyer-Davis, 2019) or in sales (Tarafdar et al., 2014)) or how it might be moder-

ated by a high leadership and low competition culture (Turel & Gaudioso, 2018). Meanwhile, less research analyzed the link of individual differences and technostress. It was examined, how individual differences might change the perception of technostress (e.g. Diaz & Rhodes, 2018; Heller et al., 2002; Marchiori et al., 2019) or how openness influence the effects of technostress on job engagement (Srivastava et al., 2015). Nevertheless, there is still a gap in research regarding the research of technostress in the context of individual traits. This study aims to fill this gap as described in the following section.

2.3 The Big Five Personality Traits and Openness

The TMSC acknowledges the existence of varying reactions to technostress depending on an individual's personal perception and weighting of the situation. In this context, the present study explores how personality traits, especially openness, influence the relationship between technostress and job satisfaction. Personality traits can be defined as a person's disposition, which may relatively stable and resistant to transformation over time (Ajzen, 1988). The five-factor model of personality, also called the Big Five model of personality traits, allows to capture the most salient personality traits of an individual through a five-dimensional structure (Heller et al., 2002; McCrae & Costa, 1991). The five factors the model comprises are extraversion, agreeableness, conscientiousness, neuroticism and openness (Goldberg, 1992). However, the present study only focuses on openness[1], which will be justified in the following section. Individuals who have a high level of **openness** can be characterized by their unconventional, flexible and divergent way of thinking and their curiosity towards new ideas (McCrae & Costa, 1991). Furthermore, open people tend to have imaginative mind-sets and a high creativity (Feist, 1998). Their openness makes them fast learners who enjoy broadening their horizons and who are willing to experience changes (Barrick et al., 2001).

[1] The study also collected data for the other four of the big five personality traits. If interested, the author can provide the information via e-mail. Please contact 33353@novasbe.pt.

In the past, openness was already studied in various forms, for example how it influences attitudes like support for creativity (Baer & Oldham, 2006). Today openness is an important personality trait which will gain relevance in the future. In the context of evolving job profiles and work environments due to ever-changing technologies, competencies of people high in openness are sought by companies (S. Parker et al., 2001). Considering that technology replaces repetitive tasks and allows for complex solutions, companies seek for special problem-solving skills (S. Parker et al., 2001), flexible thinkers which are open for new developments and creative employees (Frenkel et al., 1995).

Although openness gained high relevance for the future and also understanding technostress and its effects on job satisfaction are very important as shown in advance, research never linked these three topics. This study therefore aims to fill this research gap and explores, how openness influences the effects of technostressors on job satisfaction. This research question not only allows to understand how openness influences job satisfaction, it also accounts for the circumstances of evolving work-environments and the changing competencies sought by employers, as ICT influence companies and the way employees work. Moreover, the presented research question allows for an update on technostress study, as existing literature which is based on former ICT appears to be outdated (Arnetz, 1997; Brod, 1984).

2.4 Research question, hypotheses and conceptual model

Thus, the research question of this study is, whether openness has a moderating effect on the relationship between technostress and job satisfaction. To answer this question, in the first step it needs to be confirmed that technostress has a negative influence on job satisfaction as explored by existing literature (e.g. Ragu-Nathan et al., 2008; Tarafdar et al., 2010).

H_1: Technostress has a negative relationship with job satisfaction.

In the second step, several hypotheses regarding separate technostressors and job satisfaction were formulated. The above stated theory rises the expectations that open individuals

do not feel threatened by ICT but are curious to try out new technologies. This behavior leads to the assumption that openness functions as a protective mechanism and people high in openness perceive technostress as less stressful as other individuals. The study consequently assumes that openness moderates the effects of a certain technostressor in a way that its negative influence on job satisfaction is weaker the more open an individual is. Additionally, some specificities need to be considered for each technostressor.

As the first hypothesis, techno-overload will be examined, assuming that people high in openness would perceive overload less negative. Nevertheless, people high in openness would still experience technostress as literature also suggests that open individuals are characterized by enthusiasm which may lead to an undesirable amount of work (Ragu-Nathan et al., 2008).

H_2: *Openness positively moderates the relationship between techno-overload and job satisfaction, such that overload affects job satisfaction weaker when the level of openness is high.*

Techno-invasion arises through blurring lines between private and work life. However, it would be plausible that people high in openness do not perceive invasion as stressful, as they may be open to flexible work arrangements and would enjoy the temporal and spatial flexibility ICT brings, while being less sensitive to spillover-effects of work to private life.

H_3: *Openness positively moderates the relationship between techno-invasion and job satisfaction, such that invasion affects job satisfaction weaker when the level of openness is high.*

Concerning techno-complexity, a high level of complexity may have a demotivating and frustrating effect on individuals. Nevertheless, it will be assumed, that open people are more enthusiastic and curious to deal with new and complex tasks.

H_4: *Openness positively moderates the relationship between techno-complexity and job satisfaction, such that complexity affects job satisfaction weaker when the level of openness is high.*

It would be plausible that employees high in openness do not perceive techno-insecurity as stressful, since their openness towards changes, flexibility and willingness to

adapt would easily enable them to cope with future changes arising through ICT. Since they do not see ICT as a threat, a lack of clarity about the future does not arouse worries. Furthermore, techno-insecurity measures how people feel threatened by new hires or colleagues with better ICT skills. People high in openness are willing to adapt to changes to ICT, therefore they do not need to fear differences in competencies. Therefore, it will be assumed that:

H_5: *Openness positively moderates the relationship between techno-insecurity and job satisfaction, such that insecurity affects job satisfaction weaker when the level of openness is high.*

Finally, techno-uncertainty leads to a disruption of an employee's daily operational doing because of ICT updates, which in turn destroy routines and working habits. It will be assumed, that people high in openness have a higher flexibility and open mindset and therefore perceive these interruptions as less negative.

H_6: *Openness positively moderates the relationship between techno-uncertainty and job satisfaction, such that uncertainty affects job satisfaction weaker when the level of openness is high.*

Figure 1 allows a graphic visualization of the underlying model of this thesis.

3 Method

3.1 Participants and procedures

In order to test the proposed hypotheses, a quantitative survey was conducted and then analyzed with IBM SPSS Statistics. To carry out the survey, the SAP Qualtrics tool was used by distributing the survey link with the snowball method (Orgegon State University, 2019) via social media and the author's private network. After four weeks, 262 responses were collected whereof 52 answers due to incompleteness were deleted. To avoid the responses being affected by cultural differences as suggested by Hofstede (2001), only participants from Germany,

Austria and Switzerland were taken into consideration[2]. Therefore, five more responses were dropped. Finally, 205 responses were analyzed. The demographics of the survey participants are presented in *table 1 and 2*. The data shows that 59.5% of the participants were male and 49.5% female (gender was coded as a dummy variable). The average age in the sample is 33.53 years (SD = 10.921), with a range from 18 to 66 years. The average number of years the respondents already worked for the **current** employer (control variable called employment) amounted to 7.6 years (SD = 9.169), ranging from 0 to 35 years.[3]

3.2 Measures and reliability measures

Several existing and validated scales were used to build the survey (*appendix 1 and 2*).

Technostress: In order to measure the different technostressors, the technostress-scales from Ragu-Nathan et al. (2008) were used, consisting of 5-point Likert scales ranging from (1) 'Strongly disagree' to (5) 'Strongly agree'. As they were in English, the translations of Kaufmann (2015) were used for this study. The scales were translated in German and back translated by a native speaker following the guidelines of Brislin (1981). Cronbach's alpha was calculated: $\alpha_{\text{techno-overload}} = 0.79$, $\alpha_{\text{techno-invasion}} = 0.76$, $\alpha_{\text{techno-complexity}} = 0.86$, $\alpha_{\text{techno-insecurity}} = 0.88$, $\alpha_{\text{techno-uncertainty}} = 0.79$.

Job satisfaction: To assess job satisfaction, a 5-point Likert scale ranging from (1) 'Strongly disagree' to (5) 'Strongly agree' was taken from Ragu-Nathan et al. (2008). Cronbach's alpha amounts to $\alpha_{\text{job satsifaction}} = 0.89$.

Openness: The Big Five Inventory-10 (BFI-10) scale from Rammstedt et al., (2013) was used in order to measure the personality traits of an employee. The scale is a 5-point Lik-

[2] The six cultural dimensions of the three countries show similar scores, this proves their cultural similarity (the scores for each dimension will be presented in the order of Austria (A), Germany (G) and Switzerland (S)): **Power distance:** (A: 11, G: 35, S: 34), **Individualism**: (A: 55, G: 67, S: 68), **Masculinity:** (A: 79, G: 66, S: 70), **Uncertainty Avoidance:** (A: 70, G: 65, S: 58), **Long Term Orientation:** (A: 60, G: 83, S: 74), **Indulgence:** (A: 63, G: 40, S: 66) (Hofstede Insights, 2019).

[3] In a pre-test phase eight test participants reviewed the survey. Three sentences in the German translation were adapted, as the test participants noted distracting meaning. Changes were marked in the survey in the appendix.

ert scale, available in English and German, and ranges from (1) 'Strongly disagree' to (5) 'Strongly agree'. Spearman-Brown coefficient = 0.64[4].

Despite the hypothesized effects, it is also possible that the variables may be affected by other influences (Hayes, 2018). Therefore, control variables were included in the model in order to account for alternative variances. The control variables are (1) age, (2) gender, (3) ICT use, defined as extend of ICT use for the operational work (see Q3 in *appendix 2*) and (4) employment (number of years the respondent already works in the actual company, see Q1 in *appendix 2*). In order to measure ICT use, the participants were asked to state how often they use certain ICT means for their work and could state other tools and their extent of use. A German 5-point Likert scale (1 = ‚Never', 5 = ‚Every time') from existing literature was used (Vagias, 2006). As only participants from Germany, Austria and Switzerland were taken into consideration, no control variable for culture was incorporated.

A summary of the calculated reliability measures is given *table 3*. The English version of the survey in *appendix 2* provides additional information and describes which questions include the scales and variables presented above.

4 Results

4.1 Descriptive statistics

As shown in *table 2*, the standard deviations and correlations for the main variables of this study were calculated. The respondents stated an ICT use of M = 2.29 (SD = 0.678), while the meaning of 2 equals 'Occasionally/Sometimes' and 3 equals 'Almost every time'. This shows that the use of ICT is a crucial part of today's work environment. The average job satisfaction amounts to M = 3.76 (SD = 0.91), indicating a generally high job satisfaction of

[4] The Spearman-Brown coefficient of 0.64 is below the recommended minimum level of 0.7 (Nunnally, 1978). However, it was necessary to find a short, time efficient scale to increase the number of survey participants, which justifies the choice of this 2-item openness scale.

the test participants. The means of the five technostressors differ strongly from each other, ranging from M = 1.96 (insecurity, SD = 0.93) to M = 3.40 (uncertainty, SD = 0.80). These observations allow for important insights which stressors have higher presence in the test participants' work environments. Lastly, the test participants describe themselves as rather open, indicated by the high average of openness (M = 3.12, SD = 0.95).

4.2 Inferential statistics and hypothesis testing

In the next step, a correlation analysis was conducted with the use of Pearson's *r* to account for linear association of the different quantitative variables (Hayes, 2018) and to test for H_1 (*table 2*). The analysis included the five technostressors, openness, job satisfaction, and the four control variables stated above. Four technostressors correlate negatively with job satisfaction, while techno-uncertainty correlates positively ($r = 0.218$, $p < 0.01$). Thus, it can be stated that technostress is negatively related to job satisfaction and **H_1 is partly supported in four of the five cases explored**.

Regarding the correlations of openness with other variables, relevant insights were found. Openness correlates negatively with the technostressors complexity ($r = -0.228$, $p < 0.01$) and insecurity ($r = -0.167$, $p < 0.05$) implying that a higher amount of openness leads to a lower complexity and insecurity. This meets the expectations that people high in openness feel less stressed by technostressors, which will be further explored in the following sections. Moreover, openness correlates positively with job satisfaction ($r = 0.227$, $p < 0.01$), indicating that openness predicts the level of job satisfaction and delivering important insights for future studies. However, as the independent and control variables should be distinct from each other, the correlations between openness and the technostressors should be considered as a limitation when interpreting the results (Hayes, 2018). Age negatively correlates with job satisfaction ($r = -0.138$, $p < 0.01$), in that job satisfaction is lower the higher the age of the employee. Furthermore, also employment (number of years at current employer) negatively

correlates with job satisfaction (r = -0.171, p < 0.01), which signifies that with increasing number of years of employment, job satisfaction decreases. The other two control variables, ICT use and gender, are not significantly associated.

In order to test $H_2 - H_6$, a regression analysis was conducted. The regression model examines the effects of openness on the relationship of technostress and job satisfaction. The regression analysis was split into two parts. In the first part of the regression analysis a hierarchical model was used to account for the direct effects of all variables, namely the four presented control variables, the five technostressors as the independent variables (IV), openness as the moderator, and job satisfaction as the dependent variable (DV). Firstly, the control variables were introduced, followed by the technostressors in the second and openness in the third step of the hierarchical model. *Table 4* shows that control variables explain 5.4 % (R^2) of the effect on job satisfaction in the given regression model (Adjusted R^2 = 3.5 %), while none of the control variables are significant. The low explained variance and insignificance of variables show that the choice of the control variables should be improved in future models. Introducing the technostressors, a high change in R^2 can be observed, as it amounts to R^2 = 30.2 % (adjusted R^2 = 27.0 %) now. Introducing openness increases the R^2 to 31.3 % (adjusted R^2 = 27.7 %) (*table 4*).

As the second part of the regression model, the interaction terms (which are the product of openness and each technostressor) were added to the model. In this way, the hypothesized moderating influence of openness on the different technostressors was tested. Additionally, a regression analysis with moderator was conducted in SPSS PROCESS 26. To avoid collinearity when SPSS multiplies the technostressor and openness to create the interaction term, the data was mean-centered in advance (Hayes, 2018). Firstly, it was observed wheth-

er β_3[5] is significant and $\beta_3 \neq 0$. In order to probe the interaction, for the models with significant interactions the conditional effects of the moderator (-1 SD, mean, +1 SD) were tested for significance (*table 5*). Afterwards, to better understand the interaction, a graph was plotted using -1 SD, mean and +1 SD of the focal and moderating predictor according to the guidelines of Hayes (2018). The results are presented in the following.

H_2: Openness *positively moderates the relationship between* ***techno-overload*** *and job satisfaction, such that overload affects job satisfaction weaker when the level of openness is high.*

The results of this model (*table 6*) show that openness significantly moderates the relationship between techno-overload and job satisfaction ($\beta_3 = 0.162$, $p < 0.05$, $\Delta R^2 = 0.021$, F (1, 197) = 5.405, $p < 0.05$). The overall model fit is $R^2 = 0.237$, F (7, 197) = 8.761, $p < 0.001$. Probing the interaction (*figure 2* and *table 5*) shows that the slope is significantly different from zero in all three levels of openness, being more negative for a mean level of openness and the most negative for a low level of openness. The graph shows that techno-overload affects job satisfaction more negatively, when openness is low. Therefore, **H_2** is supported. Meanwhile, also **H_1** is supported for techno-overload because it negatively correlates with job satisfaction ($r = -0.411$, $p < 0.01$) in that techno-overload affects job satisfaction more negatively the higher the amount of overload (*table 2*).

H_3: Openness *positively moderates the relationship between* ***techno-invasion*** *and job satisfaction, such that invasion affects job satisfaction weaker when the level of openness is high.*

In the next model (*table 7*) it can be observed that openness significantly moderates the relationship between techno-invasion and job satisfaction ($\beta_3 = 0.239$, $p < 0.001$, $\Delta R^2 = 0.069$, F (1, 197) = 17.502, $p < 0.001$). The overall model fit is $R^2 = 0.214$, F (7, 197) = 7.642,

[5] β_3 represents the coefficient of the interaction term, while β_1 stands for the coefficient of the certain technostressor and β_2 stands for the coefficient of the moderator (openness).

$p < 0.001$. Whilst a high level of openness in this model is not significant, the mean and lower levels of openness are significant. As also shown in *figure 3*, openness positively moderates the effect of techno-invasion. The lower the level of openness, the more negative is the effect of invasion on job satisfaction. Hence, $\mathbf{H_3}$ is supported. Furthermore, also $\mathbf{H_1}$ is supported for techno-invasion because it negatively correlates with job satisfaction ($r = -0.207$, $p < 0.01$) and techno-invasion affects job satisfaction more negatively the higher the amount of invasion (*table 2*).

H_4: Openness *positively moderates the relationship between* ***techno-complexity*** *and job satisfaction, such that complexity affects job satisfaction weaker when the level of openness is high.*

As hypothesized, openness positively moderates the relationship between techno-complexity and job satisfaction as $\beta_3 = 0.231$, $p < 0.001$ with $\Delta R^2 = 0.050$, $F(1, 197) = 14.120$, $p < 0.001$ (*table 8*). The overall model fit is $R^2 = 0.299$, $F(7, 197) = 12.053$, $p < 0.001$. The data shows that the coefficient of openness is not significant ($\beta_2 = 0.103$, n.s.), indicating that openness does not have a direct effect on job satisfaction. Probing the interaction (*figure 4* and *table 5*) reveals that all three levels of openness differ significantly from zero, with increasingly negative slope the lower a person is in openness. From these observations the support of $\mathbf{H_4}$ is derived. Also $\mathbf{H_1}$ is supported for techno-complexity because it negatively correlates with job satisfaction ($r = -0.475$, $p < 0.01$) in that techno-complexity affects job satisfaction more negatively the higher the amount of complexity (*table 2*).

H_5: Openness *positively moderates the relationship between* ***techno-insecurity*** *and job satisfaction, such that insecurity affects job satisfaction weaker when the level of openness is high.*

From *table 9* it can be observed that openness positively moderates the relation between insecurity and job satisfaction ($\beta_3 = 0.227$, $p < 0.001$, $\Delta R^2 = 0.061$, $F(1, 197) = 16.676$,

p < 0.001). The overall model fit $R^2 = 0.279$, F (7, 197) = 10.884, $p < 0.001$. *Figure 5* and the conditional effects in *table 5* shows that insecurity affects job satisfaction weaker, if the level of openness is higher. However, a high level of openness was not significant, therefore at a high level of openness, techno-insecurity has no effect on job satisfaction. Nevertheless, from these results it can be concluded that $\mathbf{H_5}$ is supported. Additionally, $\mathbf{H_1}$ is supported for techno-insecurity because it negatively correlates with job satisfaction (r = -0.420, $p < 0.01$) in that techno-insecurity affects job satisfaction more negatively the higher the amount of insecurity (*table 2*).

H_6: *Openness positively moderates the relationship between* ***techno-uncertainty*** *and job satisfaction, such that* ***uncertainty*** *affects job satisfaction weaker when the level of openness is high*

The overall model fit for H_6 is $R^2 = 0.133$, F (7, 197) = 4.332, $p < 0.001$. However, contrary to the hypothesized expectations, openness does not significantly moderate the relationship between techno-uncertainty and job satisfaction (β_3 = 0.062, p = n.s, ΔR^2 = 0.003, F (1, 197) = 0.747, n.s) (*table 10*). Although both openness and uncertainty have direct, significant effects, no significant interaction effect was found. From this it can be derived that $\mathbf{H_6}$ is not supported. Moreover, $\mathbf{H_1}$ is not supported for techno-uncertainty. Contrary to the other four technostressors, techno-uncertainty correlates positively with job satisfaction (r = 0.218, $p < 0.01$) (*table 2*). This signifies that job satisfaction is stronger the higher the amount of techno-uncertainty.

5 Discussion

5.1 Discussion of results

The results show that in almost all cases technostress affects job satisfaction negatively, therefore **H_1 is partly supported in four of the five cases tested.** Furthermore, the results show that openness moderates the relationship between all but one technostressors and job satisfaction (results of hypothesis testing summarized in *table 11*). These observations match the expectations that open individuals do not feel threatened and stressed by ICT but are curious to try out new things and enjoy the advantages arising through new technologies. Openness moderates the effects of **techno-overload** on job satisfaction as the interaction's coefficient is significant, therefore **H_2 is supported**. It is plausible that people high in openness still experience technostress, as literature suggests that open individuals are characterized by enthusiasm which in turn may lead to an undesirable amount of work (Ragu-Nathan et al., 2008). Effects were also found for **techno-invasion** due to a significant coefficient, therefore **H_3 is supported**. While probing the interaction with conditional effects in the case of invasion the data showed that a high level of openness was not significant, confirming the expectation that people high in openness enjoy flexible work arrangements arising through ICT. Openness also significantly influences the relationship of **techno-complexity** and job satisfaction, which **supports H_4**. Furthermore, a significant moderation was found in the case of **techno-insecurity**, thus **H_5 is supported**. However, the high conditional effect of openness was not significant in this case, which is plausible as people high in openness might not perceive insecurity as stressful due to their flexibility and willingness to adapt to changes. In contrast to the hypothesized expectations **H_6 is not supported**, since openness has no significant moderating effect on the relationship between **techno-uncertainty** and job satisfaction. Indeed, techno-uncertainty positively correlates with job satisfaction ($r = 0.218$, $p < 0.01$) (*table 2*), and uncertainty has a positive coefficient ($\beta_1 = 0.227$, $p < 0.01$) (*table 10*), while all other stressors

show negative correlations (*table 2*) and negative coefficients (*tables 6 - 9*). Also other studies already identified that techno-uncertainty is an isolated technostressor, in that the association with the underlying outcomes was weaker or non-significant (Kanliang et al., 2008; Maier et al., 2015; Srivastava et al., 2015). One plausible explanation could be that nowadays ICT is changing in an enormous speed (Schwarzmüller et al., 2018). This does not necessarily mean that big changes occur occasionally. It would be also plausible that constant small changes happen on a regular base. The high mean of techno-uncertainty of M = 3.4 (*table 2*) (before mean-centering, considering a 5-point Likert scale) shows that many survey participants experience changes of ICT in everyday job routine. However, the scale for measuring uncertainty does not ask for the intensity of disruption when ICT change. This arises one possible explanation that small changes happen regularly and hence do not disturb an individual's job routine intensively. As ICT is highly dynamic nowadays, employees may be used to regular small adaptions. The positive correlation with job satisfaction may arise from new possibilities ICT based changes create or technical issues which might be solved by frequent updates. The result opens further research need.

Lastly, the results show a positive correlation between openness and job satisfaction ($r = 0.227$, $p < 0.01$), which has never been discovered by research before and which indicates the positive influence of openness on job satisfaction. The finding therefore provides important insights for job satisfaction research and offers opportunities for future research.

5.2 Recommendations for practice

The study clearly shows how openness affects the perception of stress. These results allow HR departments and managers to derive solutions and prevention strategies to avoid decreasing job satisfaction through techno-overload, -invasion, -complexity and -insecurity. While on the one hand Srivastava et al. (2015) suggests to hire employees who are more open to ICT and less susceptible, this approach is not appropriate, as employees low in openness may have

other strong characteristics and competencies which suit the job profile. Furthermore personality traits are a **relatively** stable disposition, which means that people are still adaptable to various environments (Ajzen, 1988). Therefore, this study derives recommendations for HR departments and managers for already hired employees low in openness.

As discussed in chapter 2.3 people low in openness perceive technostressors as more stressful because their perception about ICT is more negative and less open-minded. They see ICT rather as a threat than as an opportunity, hence they are not willing to adapt to them. Therefore, as a first step it is important to reframe the situation about the use of ICT and enhance their perception. This way, the first appraisal of the situation according to the TMSC will be more positive as ICT are not perceived as a threat or obstacle anymore. As a second step, situational factors can be used in order to improve work conditions. Situational factors can be various, e.g. in form of organizational mechanisms, conditions or structures (Ragu-Nathan et al., 2008). In the context of the TMSC, these factors function as coping mechanisms and provide resources which in turn influence the two steps of appraisal of a situation and hence prevent the translation of technostressors to technostress (Turel & Gaudioso, 2018). These factors can improve the first appraisal step, but it can also help people, whose first impression is negative to better cope with the situation.

A first situational factor which can help to enhance the two appraisal steps for people of all levels of openness is technical support for end-users (Nelson, 1990). Especially to avoid effects of techno-complexity, it is important to provide assistance e.g. in form of IT-helpdesks or training and workshops. Also the effects of techno-overload can be improved this way, as people who suffer from this stressor have a more intense workload because of increased technology complexity which they cannot handle. Other situational factors are stress management trainings, wellness programs and counseling programs which can additionally help to cope with all forms of technostressors (Davis & Gibson, 1994). Furthermore, job redesign and role

restructuring for certain employees are mechanisms to avoid technostress through overload or complexity (Burke, 1993). As this mean implies very specific adaptations for a single employee and hence presents high organizational effort, it would be important to clearly identify what stresses the employee the most to change his or her role or position specifically.

Beside these general situational factors, Turel & Gaudioso (2018) suggest that managers have a responsibility for implementing a high leadership culture. High leadership culture can serve as an inhibitor with indirect (moderating) and direct effects on job satisfaction. A high leadership culture would provide support for an employee and consequently reframe the situation of ICT use. Through the adaptation of a high leadership culture not only the first appraisal step would fall out better, also the second appraisal step could be enhanced as the supportive atmosphere and relationship offers additional resources. Managers therefore should adapt their leadership techniques. A high leadership culture can be achieved when leaders aim for a supportive, positive and relationship-based environment, with clear and open communication towards all employees (Turel & Gaudioso, 2018). A good relationship and clear communication between employee and manager will increase the feeling of psychological safety, and therefore empower people low in openness to express their issues and ask for additional resources to cope with technostress. The employee suffering from **techno-complexity** hence would be willing to ask for trainings or additional time to adapt to changes e.g. by lowering day-to-day work scope (Jackson, Yates, & Orlikowski, 2007). Another mean to tackle techno-complexity is help from co-workers. Paroutis & Saleh (2009) suggest, that a knowledge-sharing environment needs to be created, in which employees help each other as they are willing to sacrifice their time and put effort in team relationships. Again it would be the manager's responsibility to create the supportive atmosphere and low competition environment (Turel & Gaudioso, 2018). Additionally, to establish a knowledge-sharing environment, managers need to calculate additional and sufficient work time for their employees

which they would need when they want to help each other rather than fulfilling operational work. Furthermore, instead of individual employee goals, team goals should be established, which in turn would increase the willingness to share knowledge (Paroutis & Saleh, 2009). Implementing these means would provide employees low in openness additional resources and would enhance their first appraisal of (new) ICT as they knew that they do not solely have to cope with new challenges by their own.

Meanwhile, by tackling techno-complexity with these means, also **techno-overload** can be avoided, as people have a higher workload when they are not able to efficiently cope with new ICT. Another mean to avoid negative effects from overload is to clearly control the information flow via e-mails, which overstrains employees through information density. Managers as well as HR departments should direct the flow of knowledge to people who necessarily need them rather than spreading e-mails just for the purpose of information. For humans it is hard to prioritize and filter important data, consequently overload of information can lead to stress (Barber & Santuzzi, 2015). Furthermore, leaders should be aware of the high speed of today's work environments. As e-mails or any kind of tools allow for fast communication, also fast results are expected (Schwarzmüller et al., 2018). However, the speed of work may lead to techno-overload, because fast speed leads to an increased scope of work. Managers therefore need to be aware of the workload an employee is supposed to fulfill and consider the defined scope of an employee's job profile. Hence, being interested in an employee's work environment as well as attentive and careful are necessary requirements for a manager.

The above given means also allow to eliminate **techno-insecurity**. This stressor comprises the anxiety of employees to be replaced by colleagues or new hires with newer knowledge in ICT. Introducing a knowledge-sharing and low competition environment can help people low in openness to cope better with techno-insecurity. Additionally, to tackle

techno-insecurity it is important to provide information about job procedures as well as planned changes in the future (Jimmieson & Terry, 1998). It should be clearly communicated, what a company expects from its employees in the future, which vision the company follows and which consequences this will have on an employee's job profile and tasks. This different framing of the situation – in combination with psychological safety – switches the perception of ICT from threat to opportunity, leading to fewer techno-insecurity. Additionally, employees low in openness should be included in the decision-making processes and the development of ICT-based changes, which affect their future job profiles (Schwarzmüller et al., 2018). This not only yields in a better understanding of how ICT changes the future, but also enhances the feeling of perceived job control (van der Doef & Maes, 1999). Job control can be defined as the ability of a person to influence and decide about the matters in his/her environment. A high level of perceived job control again lowers the level of techno-insecurity in that employees feel that they have an influence and power on the design of the future and achieve higher awareness about how the future changes. Furthermore, employees have a higher scope of action to cope with different types of technostress. To sum up, again the manager with his actions and communication plays an important role to prevent this stressor.

Lastly, people low in openness also suffer from **techno-invasion** in that blurring lines between work and private life create technostress. As suggested above, a high leadership culture with clear communication can provide information about the future. Additionally, it is also a good mean to clarify today's expectations. What makes people low in openness perceive these blurring lines as stressful is that they feel threatened by ICT in that they fear the need to sacrifice their free time (De Wet & Koekemoer, 2016). Being clear about expectations towards an employee at which time and how often he/she is supposed to be connected to the ICT and to reply to messages and being clear about the scope of work he/she needs to fulfill remotely allows to reframe the situation. It enables people low in openness to focus more on

the advantages of ICT, such as spatial and temporal flexibility, instead the disadvantages. To reinforce this mean, managers should act as role models and not contact employees in their free time to avoid subliminal pressure to be constantly connected (De Wet & Koekemoer, 2016).

5.3 Implications for future research

The present study gives insights how openness influences the perception of technostress. Several mechanisms to cope with technostress were derived as implications for HR and managers. However, an interesting insight would be to find out how people low in openness exactly react to these mechanisms and how efficient they are in practice. Furthermore, the results showed that techno-uncertainty is not moderated by openness (chapter 4). Also in several previous studies no significant interaction between uncertainty and job outcomes could be found, which was shown in chapter 4. Therefore, it would be a long overdue outcome to review the 5-factor structure of technostress and the topicality of techno-uncertainty. Moreover, during the literature research for this study, an emerging trend in the use of ICT was identified. Timonen & Vuori (2018) examined how digitalization affects work visibility and concluded that new technologies increase visibility towards colleagues. Also, Schwarzmüller et al. (2018) observed that ICT applications, such as collaboration or other tools, allow for higher output transparency. According to them, these tools enable managers and colleagues to see and measure each employee's contribution (quantity and quality) in a given time frame. Hence, employees might perceive it as stressful that their performance becomes comparable and measurable, while also perceived control and pressure might be consequences. The examination of this trend, possibly as a new technostressor which could be named 'techno-visibility', would be an important achievement. As the scope of this thesis did not allow for deeper understanding of this factor, future research could conduct a survey and run a factor analysis. Lastly, this study demonstrated at the beginning, how ICT constantly changes

and hence outdates the definition of technostress. The survey of this study bases on ICT currently used in companies. However, due to the high dynamic of ICT, it would be important in the future to constantly review and update the concept of technostress on the basis of newly developed technologies.

5.4 Reflections and limitations

Although the study delivers important insights, several limitations need to be considered. It needs to be acknowledged that conducting an online survey, which was sent by private messengers and e-mails, might have an additional negative effect on employees. It is not clear whether the level of technostress was influenced by the message to conduct the survey. However, in consideration of the practicability of online surveys and the intent to reach people from different geographical parts, various firms and age levels, the approach is justifiable. Furthermore, it is important to consider the problem of causality. Although a relation between the variables of the underlying study concept was found, a regression analysis is not the appropriate approach to guarantee causality between the variables. The method is an examination at a single point in time and does not give the possibility of experimental manipulation. Instead, an experimental approach over a long-term period (e.g. one year) would be appropriate (Hayes, 2018). However, due to the given scope of the thesis and the limitations in time and resources, the chosen method is justifiable. As mentioned before, other limitations to consider are correlations between the dependent and control variables (including the moderator). As they usually should be distinct from each other (Hayes, 2018), the described correlations should be considered as a limitation for significance when interpreting the results. Furthermore, a Spearman-Brown coefficient below 0.7 for openness limits the interpretation. Nevertheless, the short scale allowed for time efficient measurement, which was important to increase the number of survey participants. Lastly, it is necessary to consider that the TMSC, as one important underlying theoretical framework to explain the concept of technostress, bases

on the assumption of individual perception. This makes it difficult for researchers and companies to objectively measure stress, as conditions may change. The perception of a certain stressor might differ in time, context and – as the study shows – personality traits. Moreover, ever-changing underlying conditions make it difficult to replicate studies and even triggered a crisis, the so-called replication crisis (American Psychological Association, 2015). Nevertheless, this does not signify that previous studies are flawed. The TMSC model still is an appropriate and justifiable approach for stress measurement, as it acknowledges individual differences in the perception of stressors.

6 Conclusion

While ICT are a key success factor for companies in the future, they create technostress and negatively influence job satisfaction. Therefore, understanding technostress and its influences on job-related outcomes is highly important. Also openness is insufficiently investigated. The present study therefore provides important insights for technostress and personality traits research. The study contributes in that it found new results on how openness moderates the relationship between technostressors and job satisfaction. Additionally, the study bases on new ICT which again delivers contribution, since existing technostress literature bases on outdated technologies while work environments constantly change due to new technologies. Lastly, interesting insights for job satisfaction research was found, as the results show a positive relationship between openness and job satisfaction. The derived practical recommendations clearly show the responsibility of managers to create a high leadership culture in order to provide necessary resources and create an environment that allows for support, knowledge sharing, psychological safety, open communication and clear expectations.

7 Bibliography

- Ajzen, I. (1988). *Attitudes, personality, and behavior*. Milton Keynes: Open University Press.
- American Psychological Association. (2015). A reproducibility crisis? The headlines were hard to miss: Psychology, they proclaimed, is in crisis. *Monitor on Psychology*, *46*(9), 39.
- Antonelli, C., Geuna, A., & Steinmueller, E. (2000). Information and communication technologies and the production, distribution and use of knowledge. *International Journal of Technology Management*, *20 No.1/2*, 72–94.
- Arnetz, B. (1997). Technological stress: Psychophysiological aspects of working with modern information technology. *Scandinavian Journal of Work, Environment & Health*, *23*, 97–103. Retrieved from JSTOR.
- Baer, M., & Oldham, G. (2006). The Curvilinear Relation Between Experienced Creative Time Pressure and Creativity: Moderating Effects of Openness to Experience and Support for Creativity. *The Journal of Applied Psychology*, *91*, 963–970. https://doi.org/10.1037/0021-9010.91.4.963
- Barber, L. K., & Santuzzi, A. M. (2015). Please respond ASAP: Workplace telepressure and employee recovery. *Journal of Occupational Health Psychology*, *20*(2), 172–189. https://doi.org/10.1037/a0038278
- Barrick, M., Mount, M., & Judge, T. A. (2001). Personality and Performance at the Beginning of the New Millennium: What Do We Know and Where Do We Go Next? *International Journal of Selection and Assessment*, *9*(1-2), 9–30. https://doi.org/10.1111/1468-2389.00160
- Bowling, N. A. (2010). Effects of Job Satisfaction and Conscientiousness on Extra-Role Behaviors. *Journal of Business and Psychology*, *25*(1), 119–130. https://doi.org/10.1007/s10869-009-9134-0
- Boyer-Davis, S. (2019). Technostress in Accounting Professionals: A Quantitative Examination of the Differences Between Managers and Non-Managers. *Journal of Accounting and Finance*, *19(2)*. https://doi.org/10.33423/jaf.v19i2.1384
- Brislin, R. W. (1981). Translation and content analysis of oral and written material. In *Handbook of cross-cultural psychology: Methodology* (pp. 389–444). Boston: Allyn and Bacon.
- Brod, C. (1984). *Technostress: The human cost of the computer revolution*. Reading, Mass: Addison-Wesley.
- Burke, R. J. (1993). Organizational-level interventions to reduce occupational stressors. *Work & Stress*, *7*(1), 77–87. https://doi.org/10.1080/02678379308257051
- Davis, A., & Gibson, L. (1994). Designing employee welfare provision. *Personnel Review*, (23(7)), 33–45.
- De Wet, W., & Koekemoer, E. (2016). The increased use of information and communication technology (ICT) among employees: Implications for work-life interaction. *South African Journal of Economic and Management Sciences*, *19*(2). https://doi.org/10.4102/sajems.v19i2.1328
- Demerouti, E., Nachreiner, F., & Schaufeli, W. (2001). The Job Demands–Resources Model of Burnout. *The Journal of Applied Psychology*, *86*, 499–512. https://doi.org/10.1037/0021-9010.86.3.499
- Diaz, L., & Rhodes, R. (2018). *Job Satisfaction: Influencing Factors, Gender Differences and Improvement Strategies*. New York: Nova Science Publishers, Inc. nlebk.
- Dimensional Research. (2015). *Collaboration trends and technology—A survey of knowledge workers*. Retrieved from

https://www.alfresco.com/sites/www.alfresco.com/files/dimesional-research-collab-survey-findings-report-082415.pdf
- Elliot, G. R., & Eisdorfer, C. (1982). *Stress and human health*. New York: Springer.
- Feist, G. J. (1998). A Meta-Analysis of Personality in Scientific and Artistic Creativity. *Personality and Social Psychology Review*, *2*(4), 290–309. https://doi.org/10.1207/s15327957pspr0204_5
- Frenkel, S., Korczynski, M., Donoghue, L., & Shire, K. (1995). Re-Constituting Work: Trends towards Knowledge Work and Info-Normative Control. *Work, Employment and Society*, *9*(4), 773–796. https://doi.org/10.1177/095001709594008
- Garca-Alcaraz, J. L., Maldonado-Macas, A. A., Alor-Hernandez, G. B., & Sanchez-Ramirez, C. (2017). The impact of information and communication technologies (ICT) on agility, operating, and economical performance of supply chain. *ADVANCES IN PRODUCTION ENGINEERING & MANAGEMENT*, *12*(1), 29–40. https://doi.org/10.14743/apem2017.1.237
- Goldberg, L. (1992). The development of markers for the Big-five factor structure. *Psychological Assessment*, *4*, 26–42. http://dx.doi.org/10.1037/1040-3590.4.1.26
- Hayes, A. F. (2018). *Introduction to Mediation, Moderation, and Conditional Process Analysis, Second Edition: A Regression-Based Approach*. New York: The Guilford Press. nlebk.
- Heller, D., Mount, M. K., & Judge, T. A. (2002). Five-factor model of personality and job satisfaction: A meta-analysis. *Journal of Applied Psychology*, *87*(3), 530–541. https://doi.org/10.1037/0021-9010.87.3.530
- Hobfoll, S., London, P., & Orr, E. (1988). Mastery, Intimacy, and Stress Resistance during War. *Journal of Community Psychology*, *16*(3), 317–331.
- Hofstede, G. (2001). *Cultures consequences: Comparing values, behaviors, institutions, and organizations across nations* (2nd ed.). Retrieved from http://widgets.ebscohost.com/prod/customerspecific/ns000558/fakeproxy/index.php?url=http%3a%2f%2fsearch.ebscohost.com%2flogin.aspx%3fdirect%3dtrue%26db%3dcat02554a%26AN%3dbiblion.NSBE20150401142131166 52%26lang%3dpt-pt%26site%3deds-live%26scope%3dsite
- Hofstede Insights, H. (2019). Cultural Dimensions (Culture Compass)—Compare Countries. Retrieved December 21, 2019, from Cultural Dimensions (Culture Compass)—Compare Countries website: https://www.hofstede-insights.com/product/compare-countries/
- Ivancevich, J. M., & Matteson, M. T. (1980). *Stress and work: A managerial perspective*. Illinois: Scott Foresman - Glenview.
- Jackson, A., Yates, J., & Orlikowski, W. (2007). *Corporate Blogging: Building Community through Persistent Digital Talk*. https://doi.org/10.1109/HICSS.2007.155
- Jacobson, R. (2013, April 24). Industry Insights—2.5 quintillion bytes of data created every day. How does CPG & Retail manage it? Retrieved November 20, 2019, from IBM Consumer Products Industry Blog website: https://www.ibm.com/blogs/insights-on-business/consumer-products/2-5-quintillion-bytes-of-data-created-every-day-how-does-cpg-retail-manage-it/
- Jimmieson, N., & Terry, D. (1998). The role of informational control in the stress strain relationship. *The 13th Annual Conference of the Society for Industrial and Organizational Psychology, Dallas, Texas*.
- Judge, T. A., Thoresen, C. J., Bono, J. E., & Patton, G. K. (2001). The job satisfaction–job performance relationship: A qualitative and quantitative review. *Psychological Bulletin*, *127*(3), 376–407. https://doi.org/10.1037/0033-2909.127.3.376

- Kanliang, W., Qin, S., & Qiang, T. (2008). Technostress under different organizational environments: An empirical investigation. *Computers in Human Behavior*, (24), 3002–3013.
- Kaufmann, I. (2015). *Chancen und Risiken der Digitalisierung—Der Einfluss von Informations- und Kommunikationstechnologien auf die Folgen von Stress am Arbeitsplatz* (Bachelorarbeit). Fachhochschule Nordwestschweiz Hochschule für Angewandte Psychologie, Windisch, Switzerland.
- Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal and coping*. New York: Springer.
- Maier, C., Laumer, S., Weinert, C., & Weitzel, T. (2015). The effects of technostress and switching stress on discontinued use of social networking services: A study of Facebook use. *Information Systems Journal*, *25*(3), 275–308. https://doi.org/10.1111/isj.12068
- Marchiori, D., Mainardes, E., & Rodrigues, R. (2019). Do Individual Characteristics Influence the Types of Technostress Reported by Workers? *International Journal of Human–Computer Interaction*, *35*(3), 218–230. https://doi.org/10.1080/10447318.2018.1449713
- McCrae, R., & Costa, P. (1991). Adding Liebe und Arbeit: The Full Five-Factor Model and Well-Being. *Personality and Social Psychology Bulletin*, *17*, 227–232. https://doi.org/10.1177/014616729101700217
- McGrath, J. E. (1976). Stress and behavior in organizations. In *M. D. Dunnette, Ed. Handbook of Industrial and Organizational Psychology* (pp. 1351–1395). Chicago: Rand-McNally.
- Nelson, D. L. (1990). Individual Adjustment to Information-Driven Technologies: A Critical Review. *MIS Quarterly*, (14), 79–98.
- Nunnally, J. (1978). *Psychometric theory*. New York: McGraw-Hill.
- Online-Marketing Praxis. (2019). Definition CRM. Retrieved December 2, 2019, from Definition CRM website: https://www.onlinemarketing-praxis.de/glossar/crm-systeme-customer-relationship-management-systeme
- Orgegon State University, O. (2019). Snowball Sampling. Retrieved December 2, 2019, from Snowball Sampling website: https://research.oregonstate.edu/irb/policies-and-guidance-investigators/guidance/snowball-sampling
- Parker, D. F., & DeCotiis, T. A. (1983). Organizational determinants of job stress. *Organizational Behavior and Human Performance*, *32*(2), 160–177. https://doi.org/10.1016/0030-5073(83)90145-9
- Parker, S., Wall, T., & Cordery, J. (2001). Future work design research and practice: Towards an elaborated model of work design. *Journal of Occupational and Organizational Psychology*, *74*(4), 413–440. https://doi.org/10.1348/096317901167460
- Paroutis, S., & Saleh, A. (2009). Determinants of knowledge sharing using Web 2.0 technologies. *J. Knowledge Management*, *13*, 52–63. https://doi.org/10.1108/13673270910971824
- Radicati Group Inc., R. (2019). *Statistics Report Email Market, 2019-2023 Executive Summary*. Retrieved from The Radicati Group, Inc. website: https://www.radicati.com/wp/wp-content/uploads/2019/01/Email_Market,_2019-2023_Executive_Summary.pdf
- Ragu-Nathan, T. S., Tarafdar, M., Ragu-Nathan, B. S., & Tu, Q. (2008). The Consequences of Technostress for End Users in Organizations: Conceptual Development and Empirical Validation. *Information Systems Research*, *19*(4), 417. Retrieved from edsjsr.
- Rammstedt, B., & John, O. (2007). Measuring personality in one minute or less: A 10-item short version of the Big Five Inventory in English and German. *Journal of Research in Personality*, *41*(1), 203–212. https://doi.org/10.1016/j.jrp.2006.02.001

- Rammstedt, B., Kemper, C., Klein, M., Beierlein, C., & Kovaleva, A. (2013). A Short Scale for Assessing the Big Five Dimensions of Personality—10 Item Big Five Inventory (BFI-10). *Methoden – Daten – Analysen*, *7*, 233–249.
- Riemer, K., Steinfield, C., & Vogel, D. (2009). eCollaboration: On the nature and emergence of communication and collaboration technologies. *Electronic Markets*, *19*(4), 181. https://doi.org/10.1007/s12525-009-0023-1
- Schwarzmüller, T., Brosi, P., Duman, D., & Welpe, I. M. (2018). How does the digital transformation affect organizations? Key themes of change in work design and leadership. *Management Revue*, *29*(2), 114–138. https://doi.org/10.5771/0935-9915-2018-2-114
- She, W., & Thuraisingham, B. (2007). Security for enterprise resource planning systems. *Information Systems Security*, *16*(3), 152–163. https://doi.org/10.1080/10658980701401959
- Srivastava, S., Chandra, S., & Shirish, A. (2015). Technostress creators and job outcomes: Theorising the moderating influence of personality traits. *Information Systems Journal*, *25*(4), 355–401. https://doi.org/10.1111/isj.12067
- Tarafdar, M., Bolman Pullins, E., & Ragu-Nathan, T. S. (2014). Examining impacts of technostress on the professional salesperson's behavioural performance. *Journal of Personal Selling & Sales Management*, *34*(1), 51–69. https://doi.org/10.1080/08853134.2013.870184
- Tarafdar, M., Tu, Q., & Ragu-Nathan, T. S. (2010). Impact of technostress on end-user satisfaction and performance. *Journal of Management Information Systems, 27*, 303–334.
- Timonen, H., & Vuori, J. (2018). *Visibility of Work: How Digitalization Changes the Workplace*. https://doi.org/10.24251/HICSS.2018.634
- Turel, O., & Gaudioso, F. (2018). Techno-stressors, distress and strain: The roles of leadership and competitive climates. *Cognition, Technology & Work*, *20*(2), 309–324. https://doi.org/10.1007/s10111-018-0461-7
- Vagias, W. (2006). Likert-type scale response anchors. *Clemson International Institute for Tourism & Research Development, Department of Parks, Recreation and Tourism, Clemson University*.
- van der Doef, M., & Maes, S. (1999). The Job Demand-Control (-Support) model and psychological well-being: A review of 20 years of empirical research. *Work & Stress*, *13*(2), 87–114. https://doi.org/10.1080/026783799296084

8 Tables

Table 1. Demographics of survey participants

Variable		Value Abs. (Rel.)
Gender		Male: 122 (59.5 %), Female: 83 (49.5%)
Age	18 to 24 years	31 (15.1 %)
	25 to 34 years	109 (53.1 %)
	35 to 44 years	26 (12.8 %)
	45 to 54 years	27 (13.2 %)
	55 to max. (66 years)	12 (5.8 %)
Employment		
	0 to 9 years	151 (73.6 %)
	10 to 19 years	23 (11.4 %)
	20 to 29 years	22 (11.8 %)
	30 to max. (35 years)	9 (4.4 %)

N = 205

Table 2. Correlations, mean and standard deviation of key variables

	Mean (SD)	Over	Inva	Comp	Inse	Unce	Open	JS
Over	2.91 (0.78)	1						
Inva	2.33 (0.99)	0.293**	1					
Comp	2.20 (0.88)	0.603**	0.307**	1				
Inse	1.96 (0.93)	0.594**	0.352**	0.730**	1			
Unce	3.40 (0.80)	-0.050	0.115	-0.045	-0.032	1		
Open	3.12 (0.95)	-0.110	-0.112	-0.228**	-0.167*	0.116	1	
JS	3.76 (0.91)	-0.411**	-0.207**	-0.475**	-0.420**	0.218**	0.227**	1
Use	2.29 (0.68)	-0.002	0.223**	-0.024	0.017	0.327**	0.063	0.081
Male	-	-0.164*	0.098	-0.199**	-0.080	0.164*	-0.085	0.119
Age	33.5 (10.9)	0.233**	0.091	0.379**	0.320**	0.027	-0.148*	-0.138*
Empl	7.6 (9.2)	0.236**	0.036	0.361**	0.368**	0.105	-0.135	-0.171*

* $p < 0.05$, ** $p < 0.01$

Note: Use = extent of ICT use at work, Male = Gender/Male, Empl = Employment/Number of years working for the current employer, Over = Overload, Inva = Invasion, Comp = Complexity, Inse = Insecurity, Unce = Uncertainty, Open = Openness, JS = Job Satisfaction (dependent variable)

Table 3. Tests of reliability

Technostress

Scale	Cronbach's Alpha	No. of items
Techno-overload	0.788	4
Techno-invasion	0.763	3
Techno-complexity	0.861	5
Techno-insecurity	0.878	4
Techno-uncertainty	0.790	4

Job satisfaction

Scale	Cronbach's Alpha	No. of items
Job satisfaction	0.887	3

Openness

Scale	Spearman-Brown	No. of items
Openness	0.638	2

Table 4. Hierarchical regression model (Part 1 of regression analysis)

DV: Job Satisfaction	Model 1		Model 2		Model 3	
	β	t	β	t	β	t
Constant	3.623	11.702**	3.473	12.381**	3.460	12.396**
Male	0.246	1.922	-0.012	-0.100	0.015	0.128
Age	-0.005	-0.510	0.010	1.240	0.010	1.263
ICT use	0.110	1.182	0.017	0.192	0.011	0.131
Employment	-0.014	-1.312	-0.011	-1.130	-0.010	-1.073
Overload			-0.181	-1.981*	-0.187	-2.049*
Invasion			-0.069	-1.117	-0.063	-1.017
Complexity			-0.313	-3.114**	-0.285	-2.812**
Insecurity			-0.070	-0.750	-0.073	-0.791
Uncertainty			0.235	3.178**	0.219	2.952**
Openness					0.104	1.735
R^2		0.054		0.302		0.313
ΔR^2		0.054		0.248		0.011
F-Statistic		2.877		9.376		8.826
p (Sig. of F)		0.024		0.001		0.001

* $p < 0.05$, ** $p < 0.01$

Table 5. Conditional effects, probing the interaction at three levels of openness (-1 SD, Mean, +1 SD, mean-centered data)

Overload

Openness	Effect[6]	se	t	*p*	LLCI	ULCI
- 0.948	-0.550	0.094	-5.835	0.001	-0.736	-0.364
0.000	-0.397	0.077	-5.146	0.001	-0.549	-0.245
0.948	-0.243	0.108	-2.249	0.026	-0.457	-0.030

Invasion

Openness	Effect	se	t	*p*	LLCI	ULCI
- 0.948	-0.387	0.075	-5.202	0.001	-0.534	-0.241
0.000	-0.161	0.060	-2.667	0.008	-0.280	-0.042
0.948	0.066	0.082	0.751	0.454	-0.106	0.237

Complexity

Openness	Effect	se	t	*p*	LLCI	ULCI
- 0.948	-0.644	0.086	-7.508	0.001	-0.813	-0.475
0.000	-0.425	0.072	-5.927	0.001	-0.567	-0.284
0.948	-0.207	0.099	-2.095	0.037	-0.401	-0.012

Insecurity

Openness	Effect	se	t	*p*	LLCI	ULCI
- 0.948	-0.523	0.075	-6.986	0.001	-0.671	-0.376
0.000	-0.308	0.067	-4.621	0.001	-0.440	-0.177
0.948	-0.093	0.094	-0.991	0.323	-0.279	-0.092

[6] 'Effect' represents the linear effect of the moderator on the dependent variable and equals $b_1 + b_3W$ (Hayes, 2018).

Table 6. Results for techno-overload

DV: Job Satisfaction	**Model 1**			**Model 2**		
	β	**t**	***p***	**β**	**t**	***p***
Constant	3.482	12.257	0.001	3.450	12.261	0.001
ICT Use	0.085	1.001	0.318	0.118	1.376	0.170
Age	0.002	0.231	0.817	0.001	0.120	0.905
Male	0.139	1.162	0.247	0.119	1.001	0.318
No.years current empl.	-0.009	-0.874	0.383	-0.007	-0.676	0.500
Openness	0.174	2.827	0.005	0.157	2.561	0.011
Overload	-0.421	-5.461	0.001	-0.397	-5.146	0.001
Openness x Overload	-	-	-	0.162	2.325	0.021
R^2	$F(6, 198) = 9.117$, $p < 0.001$, $R^2 = 0.216$			$F(7, 197) = 8.761$, $p < 0.001$, $R^2 = 0.237$		
ΔR^2				$\Delta R^2 = 0.021$, $F(1, 197) = 5.405$, $p < 0.05$		

Table 7. Results for techno-invasion

DV: Job Satisfaction	**Model 1**			**Model 2**		
	β	**t**	***p***	**β**	**t**	***p***
Constant	3.378	11.142	0.001	3.352	11.507	0.001
ICT Use	0.152	1.658	0.099	0.166	1.883	0.061
Age	-0.001	-0.127	0.899	-0.001	-0.070	0.945
Male	0.303	2.460	0.015	0.261	2.203	0.029
No.years current empl.	-0.014	-1.392	0.166	-0.011	-1.096	0.274
Openness	0.180	2.795	0.006	0.175	2.831	0.005
Invasion	-0.201	-3.234	0.001	-0.161	-2.667	0.008
Openness x Invasion	-	-	-	0.239	4.184	0.001
R^2	$F(6, 198) = 5.538$, $p < 0.001$, $R^2 = 0.144$			$F(7, 197) = 7.642$, $p < 0.001$, $R^2 = 0.214$		
ΔR^2				$\Delta R^2 = 0.069$, $F(1, 197) = 17.502$, $p < 0.001$		

Table 8. Results for techno-complexity

DV: Job Satisfaction	**Model 1**			**Model 2**		
	β	**t**	***p***	**β**	**t**	***p***
Constant	3.360	12.013	0.001	3.282	12.082	0.001
ICT Use	0.069	0.824	0.411	0.129	1.562	0.120
Age	0.008	0.930	0.353	0.007	0.916	0.361
Male	0.058	0.485	0.629	-0.020	-0.171	0.864
No.years current empl.	-0.007	-0.681	0.497	-0.001	-0.101	0.920
Openness	0.124	2.017	0.045	0.103	1.724	0.086
Complexity	-0.463	-6.317	0.001	-0.425	-5.927	0.001
Open. x Complexity	-	-	-	0.231	3.758	0.001
R^2	$F(6, 198) = 10.981$, $p < 0.001$, $R^2 = 0.250$			$F(7, 197) = 12.053$, $p < 0.001$, $R^2 = 0.299$		
ΔR^2				$\Delta R^2 = 0.050$, $F(1, 197) = 14.120$, $p < 0.001$		

Table 9. Results for techno-insecurity

DV: Job Satisfaction	**Model 1**			**Model 2**		
	β	**t**	***p***	**β**	**t**	***p***
Constant	3.435	12.071	0.001	3.373	12.292	0.001
ICT Use	0.096	1.120	0.264	0.152	1.824	0.070
Age	0.000	0.051	0.959	-0.001	-0.093	0.926
Male	0.185	1.560	0.120	0.134	1.169	0.244
No.years current empl.	-0.002	-0.230	0.818	0.002	0.251	0.802
Openness	0.159	2.571	0.011	0.137	2.302	0.022
Insecurity	-0.371	-5.497	0.001	-0.308	-4.621	0.001
Openness x Insecurity	-	-	-	0.227	4.084	0.001
R^2	F (6, 198) = 9.191, $p < 0.001$, R^2=0.218			F (7, 197) = 10.884, $p < 0.001$, R^2 = 0.279		
ΔR^2				ΔR^2 = 0.061, F (1, 197) = 16.676, $p < 0.001$		

Table 10. Results for techno-uncertainty

DV: Job Satisfaction	**Model 1**			**Model 2**		
	β	**t**	***p***	**β**	**t**	***p***
Constant	3.737	12.287	0.001	3.757	12.309	0.001
ICT Use	0.001	0.011	0.991	-0.008	-0.083	0.934
Age	0.001	0.106	0.915	0.001	0.118	0.906
Male	0.216	1.721	0.087	0.203	1.600	0.111
No.years current empl.	-0.018	-1.745	0.083	-0.018	-1.743	0.083
Openness	0.183	2.820	0.005	0.186	2.859	0.005
Uncertainty	0.220	2.684	0.008	0.227	2.753	0.006
Openness x Uncertainty	-	-	-	0.062	0.865	0.388
R^2	F (6, 198) = 4.936, $p < 0.001$, R^2=0.130			F (7, 197) = 4.332, $p < 0.001$, R^2 = 0.133		
ΔR^2				ΔR^2 = 0.003, F (1, 197) = 0.747, n.s		

Table 11. Results of hypothesis testing

H_1: Technostress has a negative relationship with job satisfaction.	Partly supported
H_2: Openness positively moderates the relationship between techno-overload and job satisfaction, such that overload affects job satisfaction weaker when the level of openness is high.	Supported
H_3: Openness positively moderates the relationship between techno-invasion and job satisfaction, such that invasion affects job satisfaction weaker when the level of openness is high.	Supported
H_4: Openness positively moderates the relationship between techno-complexity and job satisfaction, such that complexity affects job satisfaction weaker when the level of openness is high.	Supported
H_5: Openness positively moderates the relationship between techno-insecurity and job satisfaction, such that insecurity affects job satisfaction weaker when the level of openness is high.	Supported
H_6: Openness positively moderates the relationship between techno-uncertainty and job satisfaction, such that uncertainty affects job satisfaction weaker when the level of openness is high.	Not supported

9 Figures

Figure 1. Conceptual model of the study

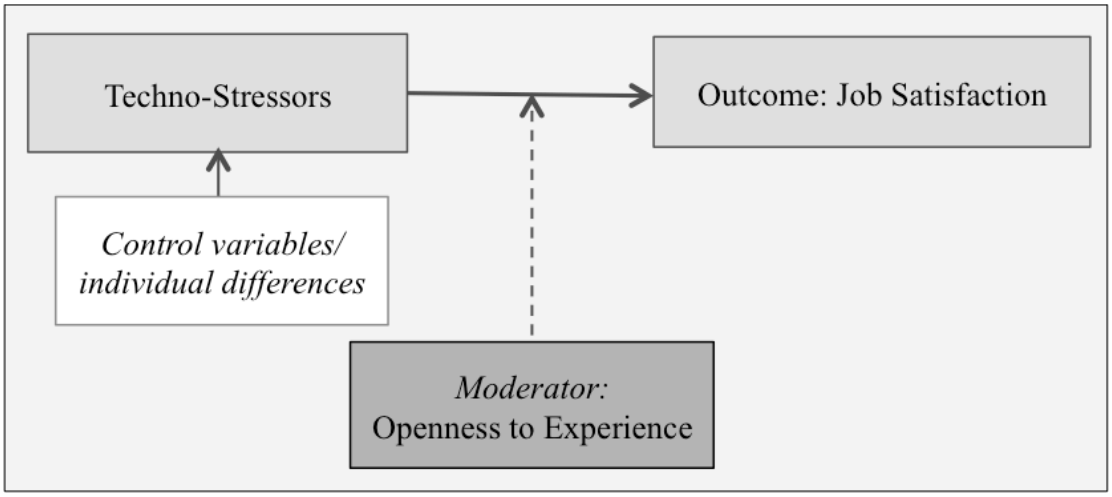


Figure 2. Plotting the interaction with conditional effects for techno-overload

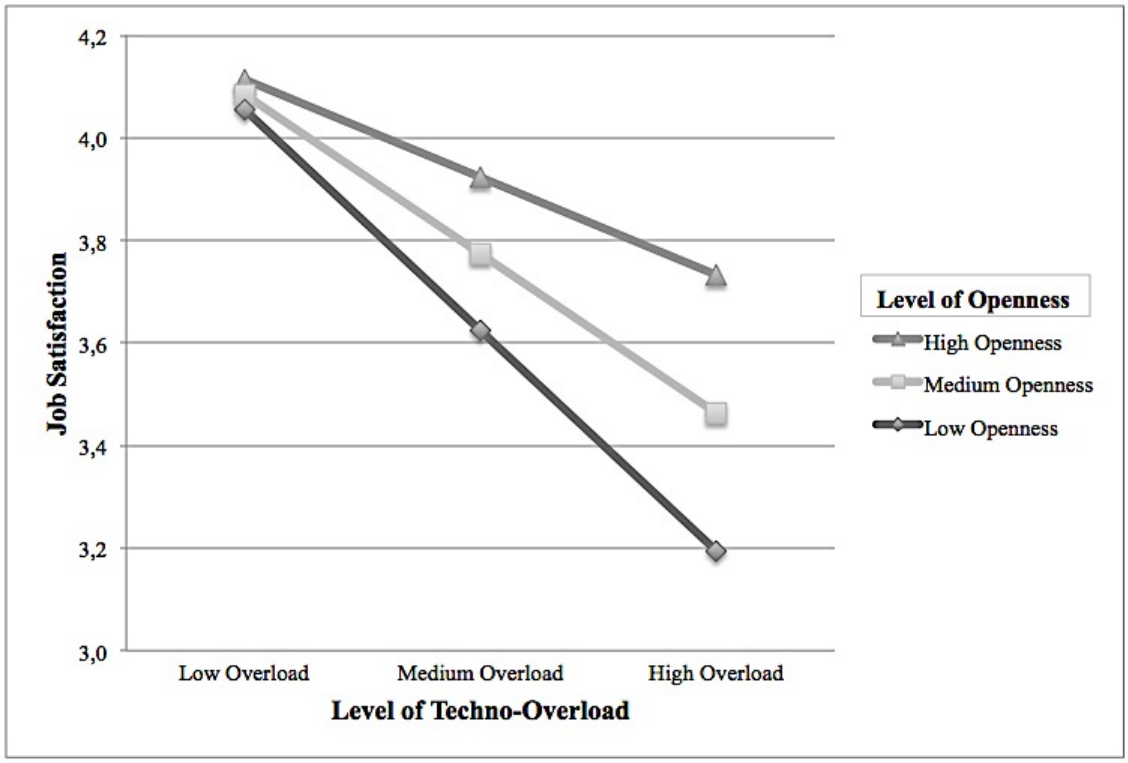


Figure 3. Plotting the interaction with conditional effects for techno-invasion

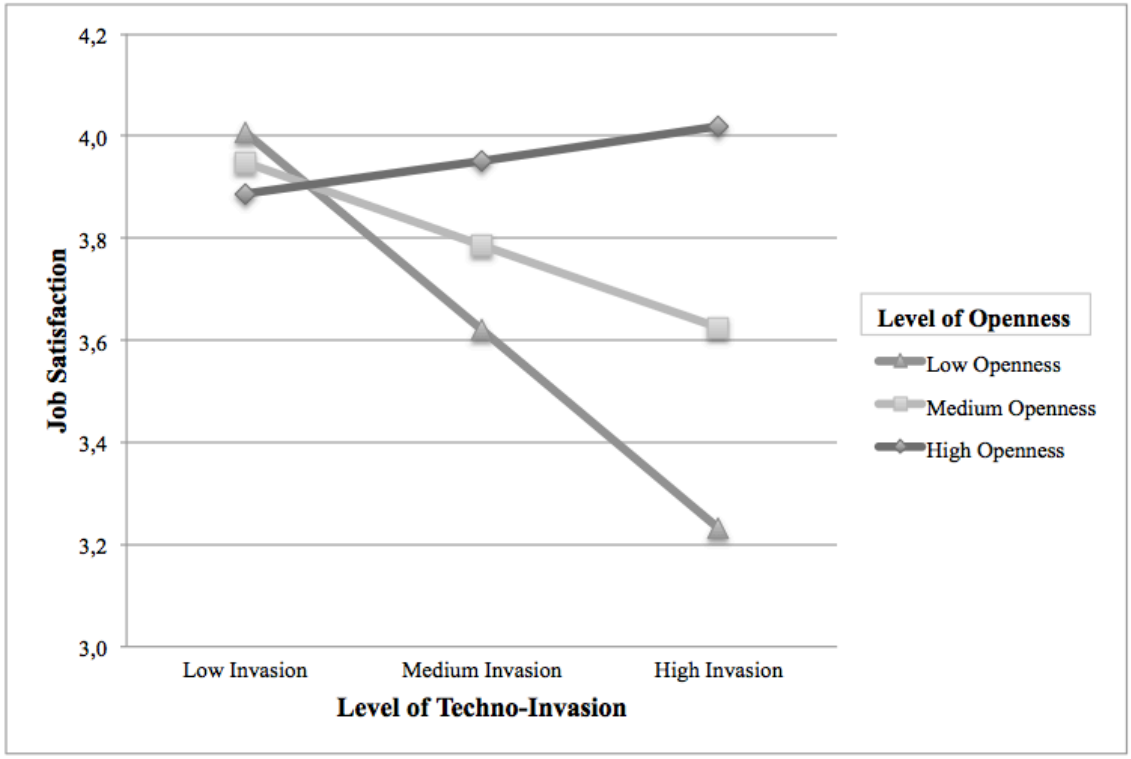


Figure 4.Plotting the interaction with conditional effects for techno-complexity

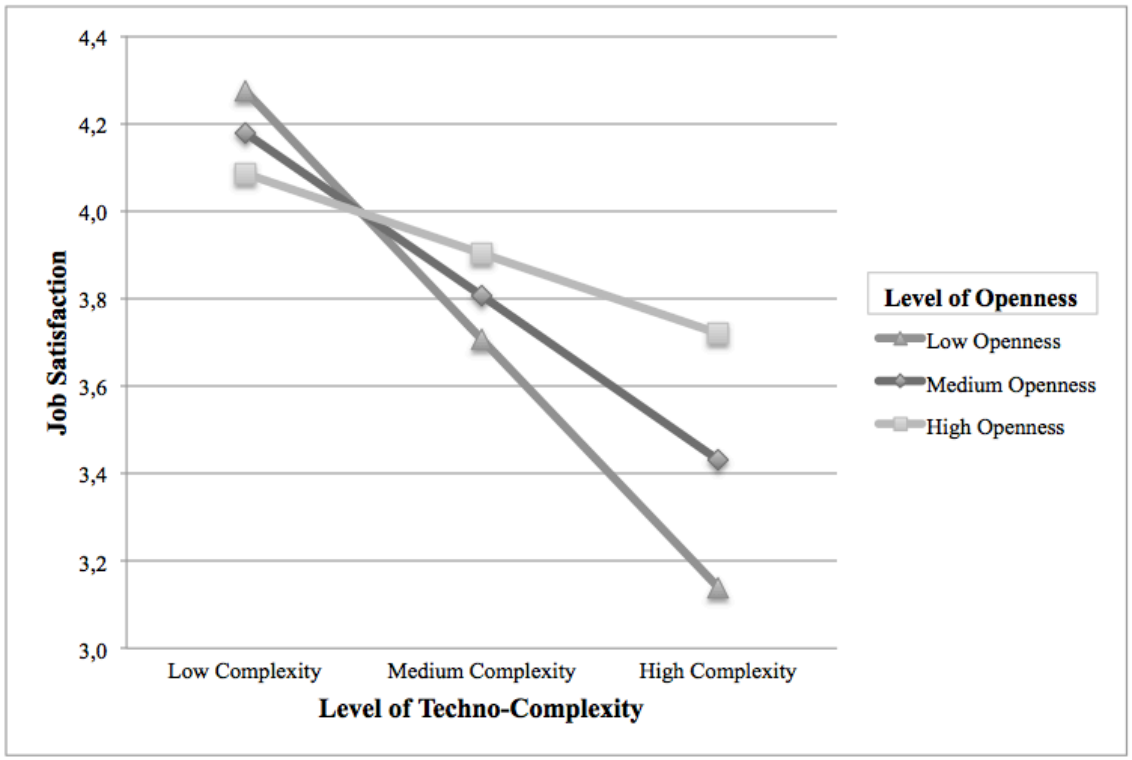
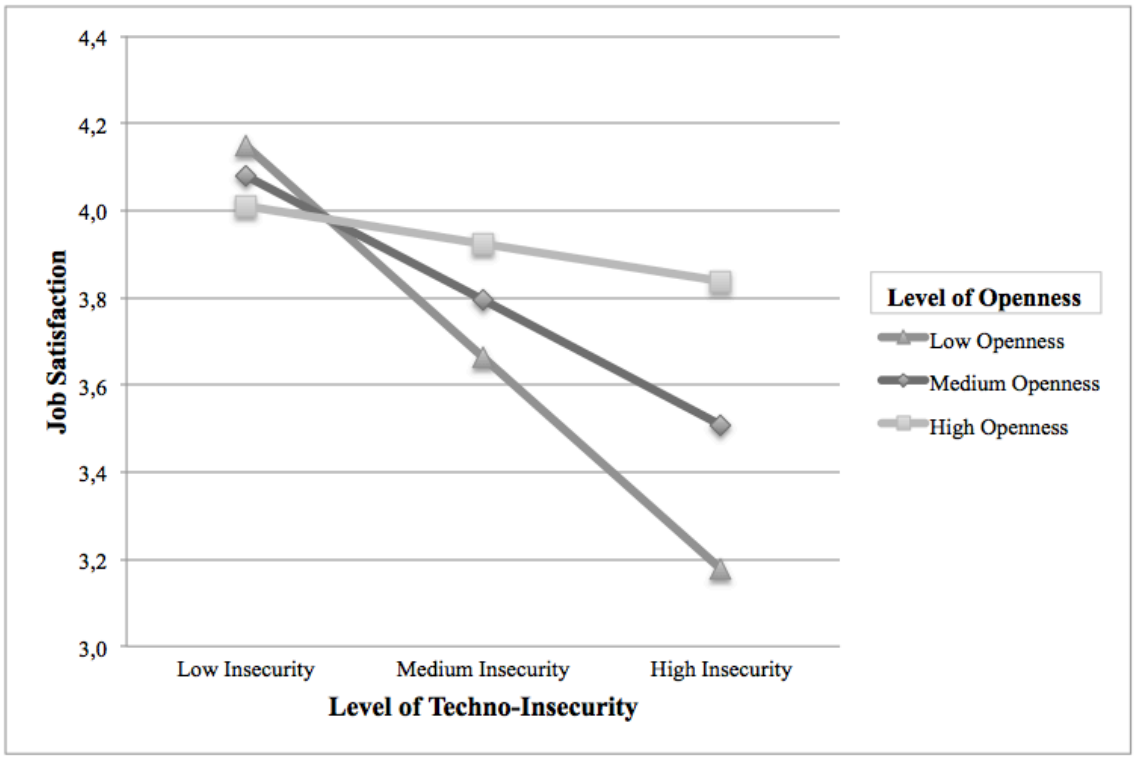


Figure 5. Plotting the interaction with conditional effects for techno-insecurity



10 Appendix

Appendix 1. Original version of survey (German)[7]

Liebe Teilnehmerin, lieber Teilnehmer,

mein Name ist Melanie Krauss, zurzeit absolviere ich meinen Master in International Management an der Nova School of Business and Economics in Lissabon. Im Rahmen meiner Masterarbeit beschäftige ich mich damit, wie die Nutzung von Informations- und Kommunikationstechnologien (IKT), Persönlichkeitseigenschaften und Stress zusammenhängen könnten.

Die Umfrage richtet sich an Personen, die Informations- und Kommunikationstechnologien (IKT) in ihrem täglichen Arbeitsalltag nutzen. *IKT definiere ich als "alle Technologien (Hardware, Software, Tools, Netzwerke, etc), die die* ***Zusammenarbeit, Interaktion und Kommunikation*** *von Mitarbeitern sowie den* ***Informations- und Wissensaustausch in einem Unternehmen*** *unterstützen".*

Neben den "klassischen" Kommunikationstechnologien wie E-Mail oder Private Messengern (z.B. Skype oder Slack), möchte ich dabei insbesondere auf alternative Applikationen eingehen, wie z.B. ***CRM*** *Systeme (Customer Relationship Management/Kundenverwaltungssysteme),* ***ERP*** *Systeme (Enterprise Resource Planning/Ressourcenplanungs-Systeme) oder* ***Collaboration Tools****/Projekt Management Tools wie z.B. Trello, Asana, Wunderlist oder* ***unternehmensspezifische*** *Software.*

** "Collaboration Tools" ist ein übergeordneter Begriff für alle Anwendungen mit dem Zweck, gemeinsam an einer übergeordneten Aufgabe zu arbeiten. Mögliche* ***Funktionen*** *dieser Tools können zum Beispiel sein,* ***Arbeitsstrategien und Deadlines zu planen, Aufgaben zu verteilen und zu koordinieren, Arbeitsvorgänge zu dokumentieren, Arbeitsdokumente zu speichern und zu verwalten, Fortschritte nachzuhalten oder Reviews und Approvals durchzuführen****.*

Die Umfrage wird ca. 7-8 Minuten dauern. Die Daten dieser Umfrage werden selbstverständlich anonym behandelt und nicht an Dritte weitergegeben. Durch die Fragen sind keine Rückschlüsse auf die befragte Person möglich.
Vielen Dank, dass Sie sich bereit erklären, mich bei meiner Masterarbeit zu unterstützen. Bei Rückfragen können Sie sich gerne jederzeit bei mir melden!

Melanie Krauss

Q1	Seit wie vielen Jahren sind Sie bereits bei Ihrem aktuellen Arbeitgeber beschäftigt?
Der folgende Frageblock zielt darauf ab, die charakterlichen Eigenschaften Ihrer Person zu erfassen. Bitte bestimmen Sie dazu, wie stark oder wie schwach eine bestimmte Aussage auf Sie zutrifft. Bitte schätzen Sie sich so ein, wie Sie sich im Allgemeinen zum heutigen Zeitpunkt sehen, nicht wie Sie sich in Zukunft entwickeln möchten.	
Q2 Inwieweit stimmen Sie folgenden Aussagen zu?	
Q2_1	Ich bin eher zurückhaltend, reserviert.
Q2_2	Ich schenke anderen leicht Vertrauen, glaube an das Gute im Menschen.
Q2_3	Ich bin bequem, neige zur Faulheit.
Q2_4	Ich bin entspannt, lasse mich durch Stress nicht aus der Ruhe bringen.
Q2_5	Ich habe nur wenig künstlerisches Interesse.
Q2_6	Ich gehe aus mir heraus, bin gesellig.
Q2_7	Ich neige dazu, andere zu kritisieren.
Q2_8	Ich erledige Aufgaben gründlich.
Q2_9	Ich werde leicht nervös und unsicher.
Q2_10	Ich habe eine aktive Vorstellungskraft, bin fantasievoll.

[7] For sources and comments please find appendix 2 (English translation)

Nutzen Sie Informations- und Kommunikationstechnologien für Ihre tägliche Arbeit – wenn ja, welche und wie häufig?

Zur Erinnerung hier die wichtigsten Definitionen:

- *Unter **IKT** versteht man alle Technologien (Hardware, Software, Tools, Netzwerke, etc), die die **Zusammenarbeit, Interaktion und Kommunikation** von Mitarbeitern sowie den **Informations- und Wissensaustausch in einem Unternehmen** unterstützen.*
- ***"Collaboration Tools"** ist ein übergeordneter Begriff für alle Anwendungen mit dem Zweck, gemeinsam an einer übergeordneten Aufgabe zu arbeiten. Mögliche **Funktionen** dieser Tools können zum Beispiel sein, **Arbeitsstrategien und Deadlines zu planen, Aufgaben zu verteilen und zu koordinieren, Arbeitsvorgänge zu dokumentieren, Arbeitsdokumente zu speichern und zu verwalten, Fortschritte nachzuhalten oder Reviews und Approvals durchzuführen**. Beispiele: Asana, Trello, unternehmenseigene Software!*
- ***ERP Systeme:** Enterprise Resource Planning Systeme, dienen zur Planung und Verwaltung von Ressourcen in einem Unternehmen/einer Organisation, so zum Beispiel auch von Personal im Bereich Projekt Management.*
- ***CRM Systeme:** Customer Relationship Management Systeme, dienen zur Verwaltung und Automatisierung jeglicher Informationen, die im Kundenkontakt anfallen und benötigt werden.*

Q3	Wie oft verwenden Sie folgende IKT für Ihre tägliche Arbeit? • E-Mail • Private Messenger • Video-Konferenz • Collaboration Tools (siehe Definition!) • ERP Systeme • CRM Systeme)
Q3b	Falls Sie sonstige IKT verwenden, welches sind diese? Wie oft verwenden Sie diese für Ihre tägliche Arbeit? (Bitte mit Angabe des Namens/der Funktion des Tools!)

*Im folgenden Teil der Umfrage wird erfasst, wie die Nutzung von Informations- und Kommunikationstechnologien (IKT) empfunden wird. Während Sie die folgenden Fragen beantworten, beziehen Sie sich bitte auf **alle** Tools, die Sie eben genannt haben. Bitte geben Sie an, inwieweit Sie folgenden Aussagen zustimmen.*

Q4_1	Durch IKT bin ich gezwungen, mehr zu arbeiten, als ich bewältigen kann.
Q4_2	Durch IKT bin in gezwungen, mit sehr engen Zeitplänen zu arbeiten.
Q4_3	Ich bin gezwungen, meine Arbeitsgewohnheiten den neuen IKT anzupassen.
Q4_4	Ich habe eine höhere Arbeitsbelastung aufgrund der steigenden Komplexität der IKT.
Q5_1	Durch die IKT bin ich auch während der Ferien ständig in Kontakt mit meiner Arbeit. *Changed to:* Durch die IKT bin ich auch während des *Urlaubs* ständig in Kontakt mit meiner Arbeit.
Q5_2	Ich muss Ferien und Wochenendzeit opfern, um mit den neuen IKT auf dem Laufenden zu bleiben. *Changed to:* Ich muss Ferien und Wochenendzeit opfern, um *bei der Bedienung der neuen* IKT auf dem Laufenden zu bleiben.
Q5_3	Ich habe das Gefühl, dass die IKT in mein Privatleben eindringen.
Q6_1	Ich weiß nicht genügend über IKT, um meine Arbeit zufriedenstellend ausführen zu können.
Q6_2	Ich benötige eine lange Zeit, um neue informations- und kommunikationstechnische Lösungen zu verstehen und anzuwenden.
Q6_3	Ich finde nicht genügend Zeit, um meine informations- und kommunikationstechnischen Kenntnisse zu verbessern und mehr darüber zu lernen.
Q6_4	Ich bin der Meinung, dass neue Mitarbeiter meines Unternehmens mehr über IKT wissen als ich es tue.
Q6_5	Oft sind neue informations- und kommunikationstechnologische Lösungen zu komplex für mich, um sie zu verstehen und anzuwenden.

Q7_1	Ich empfinde eine konstante Bedrohung meines Arbeitsplatzes durch neue IKT. *Changed to:* Ich empfinde eine konstante Bedrohung *der Sicherheit* meines Arbeitsplatzes durch neue IKT.
Q7_2	Ich muss meine IKT-Kenntnisse ständig erweitern, um meine Ersetzung (Kündigung, Versetzung) zu vermeiden.
Q7_3	Meine Anstellung ist durch andere Mitarbeiter mit aktuelleren IKT-Kenntnissen gefährdet.
Q7_4	Ich habe das Gefühl, es gibt einen geringeren Wissensaustausch von IKT-Kenntnissen zwischen Mitarbeitern, aus Angst ersetzt zu werden.
Q8_1	Es gibt ständig neue Technologien, die wir in unserem Unternehmen verwenden.
Q8_2	In unserem Unternehmen gibt es ständig Veränderungen in Bezug auf Computersoftware.
Q8_3	In unserem Unternehmen gibt es ständig Veränderungen in Bezug auf Computerhardware.
Q8_4	In unserem Unternehmen gibt es ständig Verbesserungen in Bezug auf Computernetzwerken.
Q9_1	Ich mag die Tätigkeiten und Aufgaben, die ich bei meiner Arbeit mache.
Q9_2	Ich bin stolz, meine Arbeit zu verrichten.
Q9_3	Meine Arbeit ist angenehm.
Q10	Wie alt sind Sie? (Angabe in Jahren)
Q11	Zu welchem Geschlecht fühlen Sie sich am ehesten zugehörig?
Q12	Was ist Ihre Nationalität?
Q13	In welchem Land sind Sie zur Zeit beruflich tätig?

Appendix 2. English version of survey

Dear survey participants,

my name is Melanie Krauss, I currently study International Management at Nova School of Business and Economics in Lisbon. For my master thesis I examine, how the use of information and communication technologies (ICT), personality traits and stress might be related.

The following survey addresses persons, who use ICT for their daily work. I define ICT as all technologies (hardware, software, tools, networks, etc.) which support the collaboration, interaction and communication of employees as well as the information and knowledge sharing within a company.

Besides 'classical' communication technologies as e-mails or private messenger (e.g. Skype or Slack), I would like to focus on alternative applications such as CRM systems (customer relationship management), ERP systems (enterprise resource planning) or collaboration tools /project management tools, e.g. Trello, Asana, Wunderlist or company specific software.*

'Collaboration tools' is a superordinate term for all applications, which allow for working together on a common task. Possible functions of such tools are for example planning of work strategies and deadlines, distribution and coordination of tasks, documentation of work processes, storage and administration of work documents, tracking of progress or performing reviews and approvals.

The survey will take around 7-8 minutes. The data of this survey will be treated anonymously and not forwarded to third parties. The questions do not allow making conclusions about the survey participant or the company.

Thank you for your support for my master thesis. Please feel free to contact me in case you have any questions.

Melanie Krauss

Q1[8]	For how many years do you already work for your current employer?
The following part of the survey aims to measure the personality traits of a person. Please state how strong or how weak the following statements describe your personality. While you answer the questions, please refer to your personality traits, as you see them generally and today, not how you would like to develop in the future.	
Q2 How well do the following statements describe your personality? 'I see myself as a person, who…'[9]	
Q2_1	… is reserved.
Q2_2	… is generally trusting.
Q2_3	… tends to be lazy.
Q2_4	… is relaxed, handles stress well.
Q2_5	… has few artistic interests.
Q2_6	… is outgoing, sociable.
Q2_7	… tends to find fault with others.
Q2_8	… does a thorough job.
Q2_9	… gets nervous easily.
Q2_10	… has an active imagination.

[8] Q1 measures the control variable ‚employment' (number of years of employment at current employer)
[9] Q2_1 – Q2_10: Measurement of Personality Traits. Scale taken from Rammstedt & John (2007).

Do you use ICT for your daily work? If yes – please state which ICT you use and how often.

Please keep in mind the following definitions while answering the questions:

- *ICT are defined as all technologies (hardware, software, tools, networks, etc.) which support the collaboration, interaction and communication of employees as well as the information and knowledge sharing within a company.*
- ***Collaboration tools** is a superordinate term for all applications, which allow for working together on a common task. Possible functions of such tools are for example planning of work strategies and deadlines, distribution and coordination of tasks, documentation of work processes, storage and administration of work documents, tracking of progress or performing reviews and approvals. Examples are Asana, Trello or company specific software*[10].
- ***ERP Systems:** Enterprise Resource Planning Systems are used for planning and administration of resources in a company/an organization, e.g. in the field of human resource management or project management.*[11]
- ***CRM Systems:** Customer Relationship Management Systems are used for the administration and automation of any kind of information, which are collected and needed in the contact with clients.*[12]

Q3	How often do you use the following ICT for your daily work? • E-Mail • Private Messenger • Video-Conference • Collaboration Tools • ERP Systems • CRM Systems *Survey participants needed to evaluate: Never, Almost never, Occasionally/Sometimes, Almost every time, Every time*[13]
Q3b	In case you also use other ICT, please state which tools these are. How often do you use these tools for your daily work? (Please state the name and the function of the tool.)

The following part of the survey measures how the usage of information and communication technology is perceived. While you answer the following questions, please refer yourself to the tools you mentioned before.

Please state, how much you agree with the following statements.[14]

Q4_1	I am forced by this technology to do more work than I can handle.
Q4_2	I am forced by this technology to work with very tight time schedules.
Q4_3	I am forced to change my work habits to adapt to new technologies.
Q4_4	I have a higher workload because of increased technology complexity.
Q5_1	I have to be in touch with my work even during my vacation due to this technology. *Changed the translation of the word 'vacation' to specify that free time from work is meant.*
Q5_2	I have to sacrifice my vacation and weekend time to keep current on new technologies. *Changed the translation of 'to keep current on new technologies' to specify that the work with ICT is meant, and not the content transferred via new technologies.*
Q5_3	I feel my personal life is being invaded by this technology.
Q6_1	I do not know enough about this technology to handle my job satisfactorily.
Q6_2	I need a long time to understand and use new ICT.
Q6_3	I do not find enough time to study and upgrade my technology skills.
Q6_4	I find new recruits to this organization know more about computer technology than I do.
Q6_5	I often find it too complex for me to understand and use new technologies.

[10] Riemer, Steinfield, & Vogel (2009)
[11] She & Thuraisingham (2007)
[12] Online-Marketing Praxis (2019)
[13] Q3 aims to measure the control variable ICT use. To measure it an existing scale was used (Vagias, 2006).
[14] Q4_1 to Q8_4 include the technostress scales.The scales are taken from Ragu-Nathan et al. (2008). The scale was translated to German and validated by Kaufmann (2015). Questions which needed clarification after the pretests are marked with 'changed to'.

Q7_1	I feel constant threat to my job security due to new technologies. *Changed the translation to specify the meaning of job security.*
Q7_2	I have to constantly update my skills to avoid being replaced.
Q7_3	I am threatened by coworkers with newer technology skills.
Q7_4	I feel there is less sharing of knowledge among coworkers for fear of being replaced.
Q8_1	There are always new developments in the technologies we use in our organization.
Q8_2	There are constant changes in computer software in our organization.
Q8_3	There are constant changes in computer hardware in our organization.
Q8_4	There are frequent upgrades in computer networks in our organization.
Q9_1[15]	I like doing the things I do at work.
Q9_2	I feel a sense of pride in doing my job.
Q9_3	My job is enjoyable.
Q10[16]	How old are you? (Please state in years)
Q11[17]	What is your gender?
Q12[18]	What is your nationality?
Q13	In which country are you currently working?

[15] Q9_1 – 9_3 measure job satisfaction, scales taken from Ragu-Nathan et al. (2008)
[16] Q10 measures the control variable ‚age'
[17] Q11 measures the control variable ‚gender'
[18] Q12 and Q13 measure the nationality of the employee and the country where he/she is currently working in order to avoid cultural differences.